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ANOMALOUS COSMIC RAY MEASUREMENTS IN AND OUTSIDE THE MAGNETOSPHERE: IMPLICATIONS FOR THE CHARGE STATE

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Abstract

We report preliminary results from the Joint Study of the Charge State of the Anomalous Component, a cooperative project of the space agencies of the US and the USSR. The so-called "anomalous" cosmic ray component, including the elements He, N, O, and Ne, as well as rarer species, is believed to represent a sample of neutral interstellar atoms that has been swept into the heliosphere, singly ionized, and then accelerated to energies as high as 60 MeV/nucleon. A key test of this theory is a direct verification that these energetic nuclei are indeed singly ionized. This prediction can be tested by comparing simultaneous measurements of the flux of anomalous cosmic rays made inside and outside the magnetosphere, using the geomagnetic field as a rigidity-dependent filter. Grigorov et al. have recently reported measurements of the flux of 10 MeV/nucleon C, N, and O nuclei made during 1986 to 1988 by a series of KOSMOS satellites flown in low Earth orbit. We have analyzed data from the same time periods from several instruments on IMP-8 and ICE, which were located outside the magnetosphere. We compare the O fluxes inside and outside the magnetosphere over this time period and examine the implications of these measurements for the charge state of anomalous cosmic rays.

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